CABI WORKING PAPER

One Health Explainer

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One Health Hub

January 2025

KNOWLEDGE FOR LIFE

This CABI working paper has been produced by the One Health Hub.

This project is funded by UK International Development.

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This CABI working paper has been peer-reviewed by experts at CABI and other organizations.

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Abstract

In the past two decades, the concept of “One Health” has emerged as a compelling framework for improving the health of people, animals, plants, and ecosystems. Despite its growing popularity, One Health should not be seen as a silver bullet solution to all health challenges, as many are not at the interface between sectors. What’s more, there have been serious difficulties translating One Health from ideas into practice, and many barriers still exist to operationalising the concept effectively. Nonetheless, the One Health concept continues to gather significant momentum across the globe. This explainer introduces the concept of One Health. It covers the key ideas, origins, actors, and debates, outlining One Health’s advantages relative to sectoral approaches to tackling today’s health threats. The cases at the end of the explainer provide additional examples of the added value of taking a One Health approach to address some of today’s most pressing health issues.

Acronyms and abbreviations

AfOHNet	Africa One Health Network
Africa CDC	Africa Centres for Disease Control and Prevention
AFROHUN	Africa One Health University Network
AMR	Antimicrobial Resistance
ASEAN	Association of Southeast Asian Nations
AU	African Union
CBD	Convention on Biological Diversity
CBS	Community-based surveillance
COHESA	Capacitating One Health in Eastern and Southern Africa
COP	Climate Convention Conference of the Parties
ECDC	European Centre for Disease Prevention and Control
ECHA	European Chemicals Agency
EEA	European Environment Agency
EFSA	European Food Safety Authority
EMA	European Medicines Agency
FAO	Food and Agriculture Organization
GBF	Kunming-Montreal Global Biodiversity Framework
ILRI	International Livestock Research Institute
IPPM	Integrated pest and pollinator management
JPA	Joint Plan of Action
LMICs	Low- and middle-income countries
MERS-CoV	Middle East Respiratory Syndrome
N4H	Nature for Health
OHAC	One Health Action Collaborative
OHHLEP	One Health High Level Expert Panel
OHITF	One Health Initiative Task Force
OHTG	One Health Technical Group for Europe
OHRECA	One Health Research, Education and Outreach Centre in Africa
PAHO	Pan American Health Organization
ROI	Return-on-investment
RVF	Rift Valley Fever
SARS	Severe acute respiratory syndrome
UNEP	United Nations Environment Programme
VBDs	Vector-borne diseases
WHO	World Health Organization (WHO)
WOAH	World Organization for Animal Health

Summary: key messages

- One Health is a multi-sectoral, unifying approach designed to optimise the health of people, animals, plants, ecosystems and the environment they share.
- One Health is based on the observation that the health of humans, animals, plants, and the wider environment is closely linked and interdependent. This interdependency means that no single discipline or sector can tackle threats to health that occur at the interface between humans, animals, plants, and ecosystems in isolation.
- One Health involves removing disciplinary silos and working towards greater collaboration between relevant sectors.
- There are now numerous bodies and initiatives in place designed to help increase awareness of One Health and improve coordination and collaboration between sectors and disciplines at global, regional, and national levels.
- While the One Health approach is often associated with zoonotic disease and antimicrobial resistance (AMR), it is relevant to a much wider range of health issues.
- Despite its growing popularity, there have been numerous difficulties translating One Health from ideas into practice, and several barriers still exist to operationalising the concept effectively.
- Four case studies in the explainer show how a One Health approach has been successfully applied to issues that were previously siloed.
    - A plant health clinic in Uganda began providing farmers with joint services for livestock health.
    - An outbreak of Rift Valley Fever in Sudan allowed for a One Health approach to be compared with a traditional siloed approach with vastly different results.
    - A One Health initiative in Kenya has proven beneficial to mitigating the impacts of *Prosopis juliflora*—an invasive tree species impacting human, livestock and ecosystem health.
    - The Red Cross in Kenya used a One Health approach to strengthen community resilience to the risk of zoonoses, showing the value of surveillance through health alerts and pre-emptive animal vaccination programmes.

Introduction

Today's world faces a myriad of health challenges. The multifaceted, complex nature of these threats means that they cannot be approached from a purely medical, veterinary, plant or ecological vantage. Instead, collaborative, multi-sector approaches that cut across human, environmental, animal and plant health are essential to ensuring that responses to health threats are both sustainable and effective.

In the past two decades, the concept of "One Health" has emerged as a compelling framework for improving the health of people, animals, plants, and ecosystems. In contrast to human-centric paradigms of health, One Health is based on the fact that the health of humans, animals, plants, and the wider environment is closely linked and interdependent.[1] This interdependency means that no single discipline or sector can tackle threats to health that occur at the interface between humans, animals, plants, and ecosystems in isolation. Advocates of One Health argue that removing the barriers which divide disciplines and sectors and moving away from siloed methods are pivotal to achieving a "whole of society" approach to health. Communication, coordination, and collaboration across multiple sectors, disciplines, government departments, and international organizations is seen as essential to optimising health security across One Health's domains.

There is not a single thinker or event which sparked the concept of One Health; instead, it is best understood as the product of several ideas and initiatives which developed over time. While science and technology in "Western" states have been key drivers behind the One Health approach, exchanges of knowledge and learning between and across cultures played an important role in the development of the concept.[2] There are several forebears to One Health such as "One Medicine" and "One World, One Health".[3] The term One Health is believed to have been first used in 2003.[4] Initially, the main priority of One Health initiatives was zoonotic diseases and the interplay between animal (domestic and wild) and human health. Over time, though, plant and ecosystem/environmental health have been gradually recognised as important domains and have become embedded in One Health definitions and approaches. However, there are ongoing debates about how One Health relates to similar concepts, such as EcoHealth and Planetary Heath.[5] One Health has gradually gained support from several national and international organizations.

Despite its growing popularity, One Health should not be seen as a silver bullet solution to all health challenges, as many are not at the interface between sectors. What's more, there have been serious difficulties translating One Health from ideas into practice, and many barriers still exist to operationalising the concept effectively. Nonetheless, the One Health concept continues to gather significant momentum across the globe.

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[1] One Health approaches tend to work from the World Health Organization definition of health: "a state of complete physical, mental, social, emotional and spiritual wellbeing, and not just the absence of disease or infirmity". https://www.who.int/about/governance/constitution

[2] A short reading list on historical perspectives on One Health can be found at the end of the explainer.

[3] One World One Health https://www.oneworldonehealth.org/

[4] Pettan-Brewer, C., Penn, G., Biondo, A. W., Jaenisch, T., Grützmacher, K., & Kahn, L. H. (2024). Who coined the term "One Health"? Cooperation amid the siloization. *One Health*, *18*, 100678. 10. 10.1016/j.onehlt.2024.100678

[5] Boden, L., Ferrinho, P., Ford, A., & Latusek-Jurczak, D. The Scientific Advice Mechanism provides independent scientific evidence and policy recommendations to the European institutions by request of the College of Commissioners. https://scientificadvice.eu/scientific-outputs/one-health-governance-evidence-review-report/

This explainer introduces the concept of One Health. It covers the key ideas, origins, actors, and debates, outlining One Health's advantages relative to sectoral approaches to tackling today's health threats. The cases at the end of the explainer provide additional examples of the added value of a One Health approach to address some of today's most pressing health issues.

One Health, many definitions

One Health has several definitions. Over the years, various research institutes and national and international bodies have published their attempts at defining One Health. These definitions have varied in complexity and scope. For instance, the One Health Institute of the University of California at Davis defines One Health as "an approach to ensure the well-being of people, animals and the environment through collaborative problem solving—locally, nationally, and globally".[6] Meanwhile, the CABI One Health journal defines One Health as: "Any added value in terms of human, animal, plant and environmental health, sustainability, financial savings, and social resilience, achievable by the cooperation of the human, veterinary, plant, environmental and social sciences when compared to the disciplines working independently".[7]

To develop a consensus, the One Health High Level Expert Panel (OHHLEP) developed the following definition in 2022[8]:

> *"One Health is an integrated, unifying approach that aims to sustainably balance and optimize the health of humans, animals, plants and ecosystems. It recognizes the health of humans, domestic and wild animals, plants and the wider environment (including ecosystems) are closely linked and interdependent.*
>
> *The approach mobilizes multiple sectors, disciplines and communities at varying levels of society to work together to foster well-being and tackle threats to health and ecosystems, while addressing the collective need for clean water, energy and air, safe and nutritious food, taking action on climate change, and contributing to sustainable development."*

This definition is now used by several national governments, including the UK government, as well as several international organizations. Regardless of which definition is subscribed to, the definitions have more similarities than differences, and there are key tenets visible in most definitions:

- One Health is about seeing human, animal, plant, and ecosystem health as part of a complex, interconnected system.
- Cross-sectoral and transdisciplinary approaches are needed to resolve threats to health across the One Health domains.
- Ultimately, One Health aims to address the long-term drivers of health insecurity, across the domains. This means addressing the root causes of issues such as climate change and resource depletion, biodiversity loss, pollution, and food insecurity.

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[6] Mackenzie,J. and Martyn Jeggo (2019). The One Health Approach—Why Is It So Important? *Trop. Med. Infect. Dis.* *4*(2), 88 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6630404/

[7] CABI One Health, Aims and scope, https://www.cabidigitallibrary.org/journal/cabioh/aims-and-scope

[8] Adisasmito, W. B., Almuhairi, S., Behravesh, C. B., Bilivogui, P., Bukachi, S. A., Casas, N., & Zhou, L. (2022). One Health: A new definition for a sustainable and healthy future. *PLoS pathogens*, *18*(6), e1010537 https://journals.plos.org/plospathogens/article?id=10.1371/journal.ppat.1010537

- The goal of One Health is to balance and optimise the health of people, animals, plants, and ecosystems in a sustainable manner.

Who is involved in One Health?

There are now numerous bodies and initiatives in place designed to help increase awareness of One Health as well as improve coordination and collaboration between sectors and disciplines at global, regional, and national levels.

Global

The Quadripartite for One Health plays a central role in promoting and coordinating a global One Health approach. Initially, it existed as a Tripartite comprising the Food and Agriculture Organization (FAO), the World Health Organization (WHO) and the World Organization for Animal Health (WOAH). [9] In 2021, recognizing the importance of the environment within the One Health approach, the United Nations Environment Programme (UNEP) joined the group.

In 2021, the Quadripartite created the OHHLEP, which serves as the scientific and strategic advisory group to the Quadripartite organisations in their collaborative activities. Recently, the One Health Joint Plan of Action (JPA) (2022-2026)[10] was published by the Quadripartite, outlining six priority areas or action tracks:

1. enhancing One Health capacities to strengthen health systems;
2. reducing the risks from emerging and re-emerging zoonotic epidemics and pandemics;
3. controlling and eliminating endemic zoonotic, neglected tropical, and vector-borne diseases;
4. strengthening the assessment, management, and communication of food safety risks;
5. curbing the silent pandemic of AMR; and
6. integrating the environment into One Health.

As part of the Climate Convention Conference of the Parties (COP)28 negotiations, the Quadripartite launched a guide to help countries strengthen their implementation of One Health measures, and 134 countries backed a declaration on climate and health.[11] At COP29, the WHO launched a special report urging world leaders to abandon siloed approaches to addressing climate change and health.[12] Similarly, under the Convention on Biological Diversity (CBD), the Kunming-Montreal Global Biodiversity Framework (GBF) calls for the One Health approach to be integrated into National Biodiversity Strategies and Action Plans.[13] At CBD

[9] One Health approaches tend to work from the World Health Organization definition of health: "a state of complete physical, mental, social, emotional and spiritual wellbeing, and not just the absence of disease or infirmity". https://www.who.int/about/governance/constitution

[10] FAO, UNEP, WHO, and WOAH. 2022. *One Health Joint Plan of Action (2022-2026). Working together for the health of humans, animals, plants and the environment*. FAO: Rome. https://doi.org/10.4060/cc2289en

[11] UNEP (2023), The Quadripartite launches a guide to support countries implement One Health approach, 10 December, https://www.unep.org/news-and-stories/press-release/quadripartite-launches-guide-support-countries-implement-one-health

[12] World Health Organization (2024), COP29 special report on climate change and health: Health is the argument for climate action, https://cdn.who.int/media/docs/default-source/environment-climate-change-and-health/58595-who-cop29-special-report_layout_9web.pdf?sfvrsn=dd2b816_8

[13] Convention on Biological Diversity (2022), *Kunming-Montreal Global Biodiversity Framework,* https://www.unep.org/resources/kunming-montreal-global-biodiversity-framework

COP16 in October 2024, a Global Action Plan on Biodiversity and Health was adopted, as a voluntary plan for supporting GBF implementation.[14]

Regional

North America **|** The One Health Initiative Task Force (OHITF) was created in 2007 by the American Veterinary Medical Association and the American Medical Association.[15] Over time, many groups of researchers based in North America have committed to furthering the One Health cause. In 2009, the One Health Commission was created to educate and develop One Health networks.[16] It had a newsletter readership in 2024 of 20,000, double the number before the COVID pandemic.

Europe **|** In the European Union, the One Health cross-agency task force was established in 2023.[17] This joint initiative works towards implementing the One Health approach within and between five European Union agencies: the European Centre for Disease Prevention and Control (ECDC), the European Chemicals Agency (ECHA), the European Environment Agency (EEA), the European Food Safety Authority (EFSA) and the European Medicines Agency (EMA). The Regional One Health Coordination Mechanism in Europe is responsible for setting the strategic direction, convening stakeholders and coordinating One Health actions in the region.[18] The One Health Technical Group for Europe (OHTG) acts as the secretariat for the Coordination Mechanism and helps to implement the actions of the Quadripartite in Europe.[19]

Africa **|** Ministers of health and environment in several African states demonstrated a commitment to One Health when they signed the Libreville Declaration at the first Inter-Ministerial Conference on Health and Environment in 2008.[20] A 10-year 'Strategic Action Plan to Scale Up Health and Environment Interventions in Africa' from 2019 to 2029 was launched in 2018.[21] A number of One Health network initiatives now operate in the continent including: Africa One Health Network (AfOHNet)[22] and Africa One Health University Network (AFROHUN),[23] as well as the International Livestock Research Institute (ILRI)-led Capacitating One Health in Eastern and Southern Africa (COHESA)[24] and One Health Research, Education and Outreach Centre in Africa (OHRECA)[25] networks. Founded in 2016, the Africa Centres for

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[14] Convention on Biological Diversity (2024), *Sixteenth meeting, Agenda item 22, Biodiversity and health,* https://www.cbd.int/doc/c/3a01/e211/c16499d5d7abd50251aa93f5/cop-16-l-10-en.pdf
[15] American Veterinary Medical Association (2008), *One Health - OHITF Final Report*, https://www.avma.org/resources-tools/reports/one-health-ohitf-final-report-2008
[16] One Health Commission, https://www.onehealthcommission.org/
[17] European Environmental Agency, *Cross agency One Health task force* https://www.eea.europa.eu/en/about/who-we-are/projects-and-cooperation-agreements/cross-agency-one-health-task-force
[18] World Organization for Animal Health, *Regional One Health Coordination Mechanism Terms of Reference and Operational Guideline,* https://rr-europe.woah.org/app/uploads/2021/09/tor-joint-reg-tripartite-on-one-health-20-april-final.pdf
[19] World Organization for Animal Health, *One Health Coordination Mechanism for European Region* https://rr-europe.woah.org/en/Projects/regional-one-health-coordination-mechanism/
[20] Clim-HEALTH Africa, *The Libreville Declaration on Health and Environment in Africa* https://climhealthafrica.org/wp-content/uploads/2020/05/2018-IMCHE3-THE-LIBREVILLE-DECLARATION-ON-HEALTH-AND-ENVIRONMENT-IN-AFRICA-10-Years-On-2008-2018.pdf
[21] World Health Organization, *Strategic Action Plan to Scale up Health and Environment Interventions in Africa 2019–2029,* https://www.fondation-merieux.org/wp-content/uploads/2019/05/onehealth-meeting-2019-overview-of-the-strategic-action-plan.pdf
[22] Africa One Health Network (AFROHET), https://afohnet.org/
[23] Africa One Health University Network (AFROHUN) https://afrohun.org/
[24] ILRI, Capacitating One Health in Eastern and Southern Africa (COHESA) https://www.ilri.org/research/projects/capacitating-one-health-eastern-and-southern-africa-cohesa
[25] ILRI, One Health Centre in Africa, https://www.ilri.org/research/facilities/one-health-centre-africa

Disease Control and Prevention (Africa CDC) works to strengthen the capacity and capability of Africa's public health institutions.[26] In 2018 Africa CDC created a One Health Programme. In 2022, the African Union (AU) launched the AU Interagency Group on One Health.[27] The group is tasked with implementing the One Health Strategy for Zoonotic Disease Prevention and Control across AU Member States.[28]

Latin America and the Caribbean **|** In South America, the Pan American Health Organization (PAHO) is a UN agency responsible for international health cooperation in the Americas. PAHO has promoted multisectoral approaches to health for several decades, with One Health finally being included in the official agenda in June 2021.[29] In 2014, the One Health One Caribbean One Love Project was launched[30] to promote a One Health approach to zoonotic disease surveillance, diagnosis and response in Caribbean countries.

Asia **|** Demand for collaborative, multi-sectoral responses to health threats in Asia has been growing for some time. There were some initial signs of progress such as the New Delhi Road Map for 2008.[31] More recently, the Association of Southeast Asian Nations (ASEAN) pledged support for the One Health Initiative in the region to deliver health and climate resilience in a 2023 declaration,[32]and a regional One Health Joint Plan of Action was launched in 2024.[33] The World Bank, the Asian Development Bank, and the Asian Investment Infrastructure Bank provide support to countries in Asia at the national level via financial support as well as technical assistance in the construction of health system infrastructure**.** Various academic and non-governmental initiatives have been set-up such as the One Health Action Collaborative (OHAC) at Shanghai Jiao Tong University, to assist inter-sectoral collaboration and break down professional silos.[34] The Asia Pacific Quadripartite comprises the regional offices of the four international organizations, which work together to promote cross-sectoral collaboration on One Health issues.[35]

National

There are a growing number of national One Health initiatives, particularly in Africa and Asia. Many national and subnational governments, government agencies, non-governmental

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[26] Africa Centres for Disease Control and Prevention (Africa CDC), https://africacdc.org/

[27] Africa Centres for Disease Control and Prevention (Africa CDC), (2022), African Union establishes One Health Coordination Group on Zoonotic Diseases, Press Release, 4 July. https://africacdc.org/news-item/african-union-establishes-one-health-coordination-group-on-zoonotic-diseases/

[28] Ibid.

[29] IRIS PAHO (2021), Agenda for the Americas on Health, Environment, and Climate Change 2021–2030, https://iris.paho.org/bitstream/handle/10665.2/54816/PAHOCDECE210004_eng.pdf?sequence=9&isAllowed=y

[30] One Health Commission, One Caribbean, One Love, https://www.onehealthcommission.org/documents/filelibrary/resources/OneCaribbOneLove_template_83118_w_v_6E1D713464800.pdf

[31] Government of India (2007), *A Vision and Road Map,* 6 December, https://www.woah.org/app/uploads/2021/03/newdelhi-roadmapfinal.pdf

[32] ASEAN Indonesia (2003), *ASEAN Leader's Declaration on One Health*, https://asean.org/wp-content/uploads/2023/05/11-ASEAN-One-Health-Initiative-Declaration_adopted.pdf

[33] ASEAN, One Health Network and Joint Plan of Action to Strengthen Cross-Sectoral Collaboration Across ASEAN, https://jaif.asean.org/whats-new/one-health-network-and-joint-plan-of-action-to-strengthen-cross-sectoral-collaboration-across-asean/

[34] Shanghai Jiao Tong University School of Medicine (2023), *Workshop of One Health Action Commission launched with experts around the world, and Shanghai Jiao Tong University Institute of One Health formally established,* 10 May, https://www.shsmu.edu.cn/english/info/1021/4468.htm

[35] The World Health Organization, *Asia Pacific Quadripartite One Health Workshop*, https://www.who.int/southeastasia/news/events/detail/2023/09/05/south-east-asia-events/asia-pacific-quadripartite-one-health-workshop

organizations (NGOs), and intergovernmental organizations have recognized the need for a One Health approach. The One Health Commission compiles a list of national strategies.[36] Of the 22 national One Health action plans posted by the Commission, 16 are in Africa, 5 in Asia, and one in Europe (Germany). The vast majority focus entirely on zoonoses, and some on AMR as well. For example, the One Health Strategic Plan, launched by the Zambian government in 2023, outlines a five-year strategic direction. It provides for apparatus like a One Health Steering Committee, One Health Coordinating Committee, and Technical Working Group. While the working groups cover a range of cross-cutting areas like surveillance and preparedness, the focus areas in the strategic plan are zoonoses, AMR, and food safety. [37] Vietnam's One Health Partnership for Zoonoses involves plant health stakeholders though the initiative's priority is minimizing the risk of future pandemics.[38]

Individual countries also support the development of national (and subnational) initiatives in partner countries. For example, 'Nature for Health (N4H)', an international initiative administrated by the UN, works locally and nationally to prevent pandemics and related health risks by strengthening the environmental aspects of One Health through a multi-partner trust fund.[39] The German government provided initial seed funding for N4H, and in 2022 Ecuador, Ghana, Mongolia, Rwanda, Vietnam, and Zambia joined the initiative as first partner countries. N4H second phase countries will join in 2025.

What are some of the issues that the One Health approach can help address?

While the One Health approach is often associated with zoonotic disease and AMR, it is relevant to a much wider range of health issues, and this has been recognised, albeit somewhat slowly, by several international bodies. In addition to providing overviews of the value One Health approaches can add to AMR and zoonotic diseases, this section explores some of the other areas that a One Health approach can help address.

Zoonotic diseases

Zoonotic diseases are infectious diseases that can be transmitted between animals and human and vice versa. Of all known infectious diseases of humans, 60% originate in animal populations and 75% of emerging human diseases originate in animal populations.[40] Human activities create a "perfect storm" for the transmission and spread of zoonoses, by changing the proximity and interactions between people, wild and domesticated animals, and plant species. Such activities can include, but are not limited to, changes in ecosystems and land use, intensification of agriculture, the wildlife trade, urbanization, migration, travel (both domestic and cross-border), and international trade.[41]

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[37] Federal Ministry of Economic Cooperation and Development (Germany), *One Health* https://www.bmz.de/en/issues/one-health

[38] The Viet Nam One Health Partnership for Zoonoses https://www.onehealth.org.vn/en

[39] Nature 4 Health https://nature4health.org/

[40] Kock, R., & Caceres-Escobar, H. (2022). Situation analysis on the roles and risks of wildlife in the emergence of human infectious diseases. *IUCN: Gland, Switzerland*. https://portals.iucn.org/library/node/49880 https://portals.iucn.org/library/sites/library/files/documents/2022-004-En.pdf

[41] Esposito, M. M., Turku, S., Lehrfield, L., & Shoman, A. (2023). The impact of human activities on zoonotic infection transmissions. *Animals*, *13*(10), 1646. https://www.mdpi.com/2076-2615/13/10/1646

COVID-19 is the latest and possibly best-known case of a major pandemic believed to be caused by a zoonotic pathogen.[42] During the past few decades, there have been significant, and sometimes highly deadly, outbreaks of many other zoonoses, including avian influenza, Ebola, Marburg virus disease, Middle East Respiratory Syndrome (MERS-CoV), Mpox, severe acute respiratory syndrome (SARS), swine influenza, West Nile virus, and Zika.

The nature of zoonotic disease spillover is complex. For example, there is evidence that interactions between climate change and habitat loss have led to persistent behavioural changes in bats which increased the risk of spillover of viruses from bat populations to horses and humans.[43] Ecosystem and habitat loss means that there is a shortage of the foods, which bats consume, such as pollen, nectar, and fruit. So hungry bats will look for food in areas closer to agriculture.

Bats have unique defence mechanisms that allow them to remain healthy while carrying diseases. [44] But their immune systems can be weakened by nutritional stress as a result of food shortages; this increases the likelihood of disease shedding.[45] When the bats feed in places where horses graze, it increases the risk of viruses they carry jumping from them to horses and then to humans. A One Health perspective recognizes the interventions based solely on the human health sector would not be able to address the root causes of these types of challenge and are unlikely to provide sustainable solutions. Rather, a One Health approach broadens the scope of analysis and looks to take long-term measures, such as preventing human disturbance of bats and their habitats. Recent research on bats and outbreaks of Hendra virus in Australia suggests that restoring winter-flowering forests and thus increasing the forage availability for bats has reduced incidences of this particular zoonosis.[46]

Vector-borne diseases

Vector-borne diseases (VBDs) account for approximately 17% of all infectious diseases worldwide and cause around 700,000 deaths annually.[47] The deadliest known VBD is malaria which is responsible for an estimated 249 million cases and more than 608,000 deaths globally every year.[48] Other notable examples of VBDs include Crimean-Congo fever, dengue fever, Lyme disease, and West Nile virus. Beyond mortality rates, VBDs can contribute to economic

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[42] Holmes, E. C. (2024). The emergence and evolution of SARS-CoV-2. *Annual review of virology*, *11*. https://pubmed.ncbi.nlm.nih.gov/38631919/

[43] Eby, P., Peel, A. J., Hoegh, A., Madden, W., Giles, J. R., Hudson, P. J., & Plowright, R. K. (2023). Pathogen spillover driven by rapid changes in bat ecology. *Nature*, *613*(7943), 340–344. https://www.nature.com/articles/s41586-022-05506-2

[44] Banerjee, A., Baker, M. L., Kulcsar, K., Misra, V., Plowright, R., & Mossman, K. (2020). Novel insights into immune systems of bats. *Frontiers in immunology*, *11*, 26. https://pubmed.ncbi.nlm.nih.gov/32117225/

[45] Subudhi, S., Rapin, N., & Misra, V. (2019). Immune system modulation and viral persistence in bats: understanding viral spillover. *Viruses*, *11*(2), 192. https://pubmed.ncbi.nlm.nih.gov/30813403/

[46] Eby, P et al, Pathogen spillover driven by rapid changes in bat ecology.

[47] World Health Organization & UNICEF/UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases. (2017). Global vector control response 2017–2030. World Health Organization. https://iris.who.int/handle/10665/259205.

[48] World Health Organization (2023). *World malaria report 2023*. *https://www.who.int/teams/global-malaria-programme/reports/world-malaria-report-2023*

shocks[49] and even poverty cycles because infections can limit productivity and the ability to produce food or earn income to purchase food or medical services.[50]

Africa, Asia, and the Americas have been identified as the most at-risk geographical areas from VBDs, but increased human mobility, population growth, international trade, and anthropogenic climate change have increased the risk of geographic expansion to new regions.[51] Looking forwards, warmer temperatures as a result of climate change could increase the range of certain vectors, such as mosquitoes and ticks, which would raise the risk of infection and spread.[52] The influence of human activity on disease incidence as well as the direct and indirect impact on human health and livelihoods means VBDs are highly suited to One Health approaches. Combating VBDs on national and international levels requires not only collaborative surveillance involving both medical and veterinary professionals that traverses countries and regions, but also sustained investments in research and development, especially rapid pathogen detection and vaccine technologies.

As is the case with many other responses to health challenges, siloed approaches to tackle VBDs may have negative consequences for the management of health issues in other sectors. For example, malarial mosquito control largely relies on the use of chemical insecticides, either via indoor sprays or insecticide-treated bed nets. However, as many of these insecticides are also used for agricultural pest control, the spillover of insecticides from agricultural applications into mosquito larval habitats contributes to resistance development.[53] The effectiveness of these tools is now being severely compromised by the development of insecticide resistance. There are debates over whether biological control methods could be a plausible option to address disease vectors.[54]

Ultimately, combating VBDs on national and international levels requires not only collaborative surveillance (that traverses countries and regions), involving both medical and veterinary professionals but also sustained investments in research and development, especially rapid pathogen detection and vaccine technologies.

Antimicrobial resistance

Dubbed the “silent pandemic”, an estimated 1.3 million people die worldwide each year as a direct result of AMR, with countries in sub-Saharan Africa exhibiting the highest mortality rates.[55] AMR occurs when bacteria, viruses, fungi, and parasites change over time and no longer

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[49] Chilakam, N., Lakshminarayanan, V., Keremutt, S., Rajendran, A., Thunga, G., Poojari, P. G., ... & John, D. (2023). Economic Burden of Mosquito-Borne Diseases in Low-and Middle-Income Countries: Protocol for a Systematic Review. *JMIR Research Protocols*, *12*(1). https://pubmed.ncbi.nlm.nih.gov/38079215/

[50] Bhutta, Z. A., Sommerfeld, J., Lassi, Z. S., Salam, R. A., & Das, J. K. (2014). Global burden, distribution, and interventions for infectious diseases of poverty. *Infectious diseases of poverty*, *3*, 1–7. https://idpjournal.biomedcentral.com/articles/10.1186/2049-9957-3-21

[51] Lessani, M. N., Li, Z., Jing, F., Qiao, S., Zhang, J., Olatosi, B., & Li, X. (2023). Human mobility and the infectious disease transmission: a systematic review. *Geo-Spatial Information Science*, 1–28. https://www.tandfonline.com/doi/full/10.1080/10095020.2023.2275619

[52] Githeko, A. K., Lindsay, S. W., Confalonieri, U. E., & Patz, J. A. (2000). Climate change and vector-borne diseases: a regional analysis. *Bulletin of the world health organization*, *78*(9), 1136–1147. https://pubmed.ncbi.nlm.nih.gov/11019462/

[53] Kouadio, F. P. A., Wipf, N. C., Nygble, A. S., Fodjo, B. K., Sadia, C. G., Vontas, J., ... & Mouhamadou, C. S. (2023). Relationship between insecticide resistance profiles in Anopheles gambiae sensu lato and agricultural practices in Côte d’Ivoire. *Parasites & Vectors*, *16*(1), 270. https://link.springer.com/article/10.1186/s13071-023-05876-0

[54] Thomas, M. B. (2018). Biological control of human disease vectors: a perspective on challenges and opportunities. *BioControl*, *63*, 61-69. https://pmc.ncbi.nlm.nih.gov/articles/PMC5769823/

[55] GRAM (Global Research on Antimicrobial Resistance) https://www.tropicalmedicine.ox.ac.uk/gram

respond to medicines, making infections harder to treat. This affects humans, livestock, and crops. AMR has been accelerated by human behaviour, mainly the misuse and overuse of antimicrobials. Although AMR affects all countries, low- and middle-income countries (LMICs) have been disproportionately impacted. There are many drivers behind this, but socio-economic factors have played a significant role. Health systems in LMICs often lack resources to reach large populations, which means access to healthcare facilities is poor, especially in rural areas.[56] As the range of antimicrobials available in LMICs is limited, it leads to misuse or overuse of the ones that are available. Moreover, the lack of effective regulatory frameworks on the sale of antimicrobials has worsened the problems of misuse in LMICs.[57]

Whilst originally developed to treat infections in humans and animals, antibiotics are now widely used to negate poor hygiene standards in farming systems, and as animal growth promoters which are effective even in the absence of disease. Antibiotic use in crop production to control bacterial disease is also considered misuse by many in the field. Resistances to fungicides are also real issues in agriculture. Some have direct effects on the treatment of human diseases (e.g. azole-resistance in human pathogenic Aspergillus).

The multifaceted problem of antimicrobial misuse involves diverse stakeholders and traverses several health domains. However, many national strategies, especially those of LMICs, lack the policies and frameworks necessary to support multi-sectoral coordination, meaning efforts to curb AMR usually occur in a fragmented manner. One Health approaches to AMR which entail close collaboration between health care workers, veterinarians, other animal health providers, and even plant health professionals can ensure more effective, coordinated and cross-sectoral strategies are implemented.

Mycotoxins

Mycotoxins are fungal secondary metabolites, produced by certain moulds. They can be found in food and are extremely toxic to humans and animals, even at low concentrations (parts per billion). Effects on humans and animals can be acute (immediate sickness) or longer term (many are powerful carcinogens). Mycotoxins have no taste, nor do they discolour the produce, making detection very difficult. As mycotoxins are largely heat-stable, they are not destroyed by cooking. Mycotoxins are believed to contaminate the diet of a large proportion of the world's population and the effects of climate change are predicted to increase cases of mycotoxin contamination worldwide.[58]

As mycotoxins are produced during the growth of the crop, and its subsequent storage, all parts of the food chain need to be involved in management, mitigation, and prevention. The toxicity of mycotoxins to humans and animals and the potential for them to carry over into food and feed products makes it essential that both livestock and human health sector representatives are engaged when addressing the issue.

Pesticide hazards

[56] Otaigbe, I. I., & Elikwu, C. J. (2023). Drivers of inappropriate antibiotic use in low-and middle-income countries. *JAC-Antimicrobial Resistance*, *5*(3), https://academic.oup.com/jacamr/article/5/3/dlad062/7187015
[57] Iskandar, K. et al (2020). Drivers of antibiotic resistance transmission in low-and middle-income countries from a "one health" perspective—a review. *Antibiotics*, *9*(7), 372. https://www.mdpi.com/2079-6382/9/7/372
[58] Kos, J., Anić, M., Radić, B., Zadravec, M., Janić Hajnal, E., & Pleadin, J. (2023). Climate change—A global threat resulting in increasing mycotoxin occurrence. *Foods*, *12*(14), 2704.

About one-third of agricultural products produced across the globe rely on the application of pesticides to ensure yields are maximized.[59] However, exposure to pesticides can cause both acute and chronic illnesses in humans, livestock, and wildlife.[60] Pesticides can also impact the environment by altering terrestrial and aquatic ecosystems, changing biodiversity in the soil, and poisoning pollinators. Historically, plant health specialists alone helped reduce pesticide risk, but this was often isolated even from medical poisonings. Working with stakeholders from human, animal, and environment sectors will have greater benefits and create higher incentives for change in the plant health sector.

Insect pollinators sustain more than 85% of the world's major food crops and 80% of flowering plants in natural ecosystems. Recent reports of global declines of insect pollinators, however, have raised concerns over the sustainability of pollination services and associated contributions to animal and human health. As pesticide use contributes to the global decline in insect pollinator communities, integrated pest and pollinator management (IPPM) has emerged as a way to better integrate the management needs of pests, natural enemies, and pollinators in agroecosystems.[61] For example, the adoption of IPPM in watermelon crops in the United States of America has lowered insecticide applications by 77%, enhanced pollinator foraging by 62%, and boosted yields by 49%.[62]

Despite the obvious "One Health features" of pesticide hazards, there is a disconnect between the agencies and structures dealing with pesticide risk management, and those considered part of One Health. For example, alongside the Quadripartite, there is also a long-standing cross-sectoral, multi-stakeholder collaboration between FAO and WHO on pesticide management, going all the way back to 1963.[63] Through subject-specific "joint meetings," they promote global standards and good practices to protect human health and the environment as well as agriculture development.[64]

Ecosystem degradation

The link between the health of humans and ecosystems[65] has been recognised for a long time. Healthy ecosystems offer living organisms a variety of services including food, clean air, and fresh water. The biosphere plays a huge role in the regulation of climate change. What's more, wild animals and insects significantly support crop production through functions such as

[59] Tudi, M., Daniel Ruan, H., Wang, L., Lyu, J., Sadler, R., Connell, D., ... & Phung, D. T. (2021). Agriculture development, pesticide application and its impact on the environment. *International journal of environmental research and public health*, *18*(3), 1112.

[60] Bernardes, Mariana Furio Franco, et al. (2015) "Impact of pesticides on environmental and human health." *Toxicology studies-cells, drugs and environment*, pp195–233.

[61] Lundin, O., Rundlöf, M., Jonsson, M., Bommarco, R., Williams, N.M. (2021). Integrated pest and pollinator management –expanding the concept. *Front. Ecol. Environ.* 19, 283–291, https://doi.org/10.1002/fee.2325

[62] Leach, A., Pecenka, J., Kaplan, I. (2022). Does IPPM bear fruit? Evaluating reduced-risk insecticide programmes on pests, pollinators and marketable yield. *Journal of Applied Ecology,* 59, 2993–3002. https://doi.org/10.1111/1365-2664.14294.

[63] FAO/WHO Joint Meeting on Pesticide Residues (JMPR) https://www.fao.org/pest-and-pesticide-management/guidelines-standards/faowho-joint-meeting-on-pesticide-residues-jmpr/meetings-jmpr/en/#:~:text=The%20JMPR%20has%20met%20annually,food%20moving%20in%20international%20trade.

[64] FAO/WHO pesticide management: https://www.fao.org/pest-and-pesticide-management/guidelines-standards/en/

[65] The United Nations Environment Programme (UNEP) defines an ecosystem as a dynamic system of living and non-living components that interact as a functional unit: Living components: Plant, animal, and micro-organism communities, Non-living components: The environment, including weather and landscape

pollination and natural pest control. For humans, ecosystems are a source of the raw materials used for food and in modern and traditional medicines.[66]

Over the past two centuries, biodiversity loss and the linked degradation of ecosystems have accelerated at an alarming rate as a result of human behaviour. Research has suggested that six of the nine "boundaries", which describe the safe limits that the impacts of human activities can have on the Earth system, have now been transgressed.[67] The drivers behind this include the unsustainable exploitation of resources, land-use change, the illegal wildlife trade, and the impacts of anthropogenic climate change. A byproduct of ecosystem degradation is that humans are coming into contact with wildlife more frequently. This raises the risk of human exposure to emerging infectious diseases.

Reduced ecosystem health can also lead to less obvious changes in human well-being. One study showed that people faced with invasions of *Prosopis* trees are less likely to believe that they have control over outcomes in their lives. Mindset-based factors – such as the extent to which individuals believe that they control the events in their lives, as opposed to such events being determined by external factors – are increasingly recognised to be related to poverty and welfare outcomes. The authors of the study recommended that programmes for building households' resilience to (environmental) shocks may be a step in the right direction for improving their psychological well-being.[68] The study emphasizes the interconnection between ecosystem changes and human behaviour, particular in an agricultural context. The utility of a One Health approach here is recognizing the benefits that improving resilience to climate and ecosystem changes can have on both ecological and human health outcomes.

Operationalising the One Health approach: some lessons learned

There is a growing evidence base of country experiences of, and lessons learned on, effective implementation of One Health approaches. While every context influences how One Health approaches are shaped and implemented, there are certain "good practices" that appear repeatedly in studies. These include joint priority-setting, formalized coordination mechanisms to connect sectors and diverse stakeholders, and high-level commitment. [69,70]

A frequently cited barrier to effective One Health operationalization is the existence of institutional and disciplinary silos that hinder sustainable, cross-sector collaboration. Sector and disciplinary barriers have proven hard to break down, and there are even arguments that One Health risks becoming a silo on its own, given the narrow topical focus which is common.

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[66] The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (2019), Global Assessment Report on Biodiversity and Ecosystem Services. https://www.ipbes.net/global-assessment

[67] Stockholm Resilience Centre, Planetary Boundaries. https://www.stockholmresilience.org/research/planetary-boundaries.html

[68] Paul Jr, M. (2022). Ecological shocks and non-cognitive skills: Evidence from Kenya. *Ecological Economics*, *194*, 107330.

[69] Barton Behravesh, C., Dutcher, T., Sleeman, J. M., Rooney, J., Hopkins, C., Goryoka, G., ... & Wendling, N. M. (2024). One Health Best Practice Case Study: Advancing National One Health Coordination in the United States through the One Health Zoonotic Disease Prioritization Process. *One Health Cases*, ohcs20240025. https://www.cabidigitallibrary.org/doi/10.1079/onehealthcases.2024.0025

[70] Debnath, N., Rahman, M., Flora, M. S., Shirin, T., Kalam, M. A., Kabir, J., ... & Rahman, M. (2024). Toward the Institutionalization of a One Health Agenda: What the World can Learn from Bangladesh. *One Health Cases*, https://www.cabidigitallibrary.org/doi/10.1079/onehealthcases.2024.0018

Despite the broadening of the One Health concept in recent years, actions and investments remain strongly focused on zoonoses and AMR, as illustrated by the JPA of the Quadripartite, and national action plans.[71] The dominance of One Health by vets and physicians means other agricultural challenges, such as pesticide risks and mycotoxin as well as issues related to ecosystem health and pollution are not as well embedded in strategies as they could be. Moreover, the massive investments in pandemic prevention and AMR risk skewing efforts to stimulate cross-sectoral action and innovation targeting specific areas of One Health work related to zoonoses and AMR.

A recent systematic mapping of existing evidence on One Health in Africa, with a focus on Ethiopia, Kenya and Uganda,[72] found that one of the key challenges facing operationalization is the dependence of cross-sectoral collaboration on donor funding, a situation which makes any One Health-related actions unsustainable. Furthermore, there is a perception that One Health creates extra work and is not part of existing job profiles, which inhibits joint cross-sectoral actions. Expert consultations and the literature review for the study highlighted the need for high-level leadership, resource allocation within state budgets, legal frameworks, joint prioritization, and curricula development.

The study made the following recommendations:

- *One Health requires a scaled approach from community to district (subnational), province and national levels.*
- *Special attention should be given to addressing current implementation challenges at the subnational level and across borders*.
- *One Health will have to be institutionalized and fully owned by the different services involved to make existing initiatives sustainable.*
- *More practical evidence is needed on how One Health can be operationalized at the interface of different ministries and levels*
- *[More evidence is needed] to understand context-specific outcomes of One Health approaches for different health areas in the three countries.*
- *New initiatives should concentrate on further integrating collaborative actions into the daily business of animal, human and environmental services and job descriptions.*

One Health in action

Another issue which is seen to hamper One Health operationalization concerns demonstrating the added value of One Health approaches. Investment in One Health initiatives and the structures required to support them at the country level remains highly challenging as investments commonly require demonstrated evidence of economic value or return.[73] Donors are also seeking return-on-investment (ROI) data to inform their own research and development programming. Efforts are being made to generate such evidence, and the FAO One Health Knowledge Nexus includes a community of practices on ROI. [74] While by no means exhaustive,

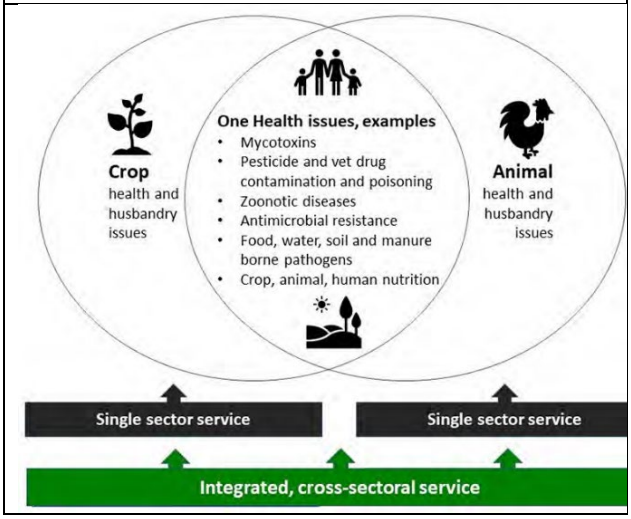
[71] One health Commission, One Health Strategic Action Plans, https://www.onehealthcommission.org/en/resources__services/one_health_strategic_action_plans/
[72] Heitz-Tokpa, K., Kaiser-Grolimund, A., Savilaakso, S., Petrovan, S., Chimwaza, G., Ssenono, R., Kinengyere, A. A., Moyo, M., Mabhula, M., Crump, L., Alokit, C., Mutiiria, M., Chepkorir, K., Tschopp, R., Danielsen, S., Haddaway, N. R., Skidan, O., Porciello, J., & Zinsstag, J. (2024). Understanding the critical factors which support or inhibit the effective implementation of the One Health approach in Africa. *Juno Reports*. https://orcid.org/0000-0002-0507-4194
[73] Auplish, A., Raj, E., Booijink, Y., de Balogh, K., Peyre, M., Taylor, K., ... & Häsler, B. (2024). Current evidence of the economic value of One Health initiatives: A systematic literature review. One Health, 100755.
[74] virtual-learning-center.fao.org/local/vlcs/view.php?id=12

the examples below provide some practical demonstrations of how the One Health approach has successfully worked on the ground in various contexts.

Case 1: Integrated crop-livestock services for farmers

In 2021, Uganda began piloting crop-livestock clinics as a novel type of integrated service for farmers. While crop and livestock health are crucial to agricultural productivity and farmers' livelihoods, farmer advisory services are scarce and underfunded, leaving most smallholders unserved. Prior to the pilot, dozens of districts already had experience of running plant clinics—a simple plant health diagnostic and advisory service delivered by extension staff ("plant doctors"). Yet, farmers often asked for advice on their animals as well, because they had nowhere else to go. Thus, demand for both crop and animal advice was the primary driver behind the establishment of crop-livestock clinics using existing organizational structures and capacities within the district. Soon, however, the One Health dimension of the clinics became apparent (Figure 1).

Figure 1. Cross-sector vs. single-sector approach vis-à-vis the One Health crop–livestock interface



Lessons from the first pilot years show that: (i) crop and livestock staff are able to share operational costs, knowledge and insights in a way that they would not normally be able to; (ii) providing crop and livestock consultations in the same place saves time for farmers and provides opportunities for cross-learning—farmers 'hang around' to hear the advice other farmers receive and exchange information with one another; (iii) joint clinics are an entry point for improving referral systems and targeting delivery of technology such as animal vaccines and clean cassava cuttings; and (iv) crop–livestock clinics provide an avenue for finding out what farmers do and don't know about One Health issues—crucial information to design solutions. These positive experiences have led to some districts investing their own funds in expanding the "joint clinic" operations to more sub-counties.

Link: How Crop–livestock Clinics Are Advancing One Health: A Pilot Case from Uganda

Case 2: Rift Valley Fever in Sudan

Rift Valley Fever (RVF), a viral disease carried by mosquitoes, is endemic to Sudan. There have been numerous outbreaks affecting humans and animals documented in the past 50 years. RVF outbreaks have caused significant economic losses in Sudan due to livestock travel and trade restrictions, as well as high mortality and abortion rates among infected animals. In Sudan, because exports of livestock contribute significantly to the national economy (over 20% of its gross domestic product), outbreaks can cause major socio-economic shocks.

For several reasons, which include the conflicts in the country, preventing the spread of RVF has proven difficult in Sudan. But the northeastern African state's response to an outbreak in 2019 offers important lessons for applying a One Health approach.

In October 2019, following an outbreak of RVF, which began in the River Nile State and spread into six other states, a mass cross-sectoral response and containment mission was launched. This mission involved the Sudanese Ministry of Health, the Sudanese Ministry of Livestock, and the World Health Organization. The multi-sectoral response strategy, which has been described as a One Health approach, involved several interventions and capacity-building measures, including active surveillance and management of infection cases; health education and promotion; and vector surveillance and control.

Comparing the outcomes of two different response strategies to two outbreaks of RVF in similar settings in Sudan's River Nile State reveals the effectiveness of interventions that employ a One Health approach. In the locality of Ad-Dāmar, a routine intervention to an earlier RVF outbreak that occurred between May and July 2019 saw 1,129 cases and 19 fatalities in humans. In comparison, the integrated intervention in Berber saw 246 cases and 7 deaths between September 2019 and January 2020. For livestock, Ad-Dāmar experienced at least 1,104 deaths and/or abortions, whilst Berber saw 201 deaths and/or abortions. Overall, these findings highlight the utility of implementing a One Health strategy for the containment and control of RVF outbreaks.

Link: One Health Response for Rift Valley Fever Outbreak in Sudan

Case 3: Understanding and managing invasive species: *Prosopis juliflora* in Kenya

Prosopis juliflora is considered one of the world's most threatening invasive tree species. Since its deliberate introduction in eastern Africa, *Prosopis* has spread rapidly across the region. For example, a 2019 study found that over 35 years the species has invaded 1.2 million hectares of land in one lowland region in Ethiopia.[75] Over time, the negative impacts of this tree on the health of plants, animals, humans, and ecosystems have outweighed its benefits as a source of charcoal or livestock feed. In invaded areas, *Prosopis* can consume half of the total annual rainfall[76] thereby reducing groundwater levels and exacerbating the effects of a changing climate. This means that their presence in an area makes it difficult for surrounding trees and grass to survive and reduces forages for grazing livestock.

The spread of *Prosopis* trees has also been connected more indirectly to serious threats to human health in sub-Saharan Africa. In villages in Mali, where flowering branches of *Prosopis* were experimentally removed, the population density of malaria-transmitting mosquitoes dropped by 70%.[77] In Kenya, a combination of *Prosopis* invasions and long periods of drought led to the drying up of parts of the Lorian Swamps, one of the country's most important wetlands. This exposed sandy soils and created a breeding ground for sandflies, the vector for leishmaniasis. The dramatic increase of phlebotominae sandflies in the region saw a rise in the number of cases of people exhibiting symptoms of leishmaniasis infections.[78]

[75] Shiferaw, H., Bewket, W., Alamirew, T., Zeleke, G., Teketay, D., Bekele, K., ... & Eckert, S. (2019). Implications of land use/land cover dynamics and Prosopis invasion on ecosystem service values in Afar Region, Ethiopia. *Science of the Total Environment,* 675, 354–366.

[76] Shiferaw, H., Alamirew, T., Dzikiti, S., Bewket, W., Zeleke, G., & Schaffner, U. (2021). Water use of Prosopis juliflora and its impacts on catchment water budget and rural livelihoods in Afar Region, Ethiopia. *Scientific Reports*, 11(1), 2688.

[77] Muller, G. C., Junnila, A., Traore, M. M., Traore, S. F., Doumbia, S., Sissoko, F., ... & Beier, J. C. (2017). The invasive shrub Prosopis juliflora enhances the malaria parasite transmission capacity of Anopheles mosquitoes: a habitat manipulation experiment. Malaria journal, 16, 1–9.

[78] Schaffner, U., Richardson, D., van Wilgen, B. (2025) Using the One Health concept to assess the multi-dimensional impact of invasion by Prosopis trees (in press).

The Government of Kenya's initial response to the *Prosopis* invasion was "utilization". This strategy involved attempting to use the *Prosopis* invasion to improve the livelihood of communities by promoting increased use of the trees for charcoal and beekeeping. While this did yield some economic benefits for local communities, it failed as a management strategy, as *Prosopis* trees continued expanding their range at a rate of between 4% and 15% per year.

In 2020, however, the Kenyan government developed a new strategy and action plan that was based on a three-tiered approach: prevention of new invasions; early detection; and rapid response in areas with low densities, and density reduction and asset protection in densely invaded areas. The development of the strategy involved coordinating efforts across various sectors, including national and local government, local communities, community-based organizations, non-governmental organizations, environmental agencies, the health sector, the private sector, and landholders. The action plan is expected to run from 2024 to 2033, with the long-term goals of stopping the invasion process, enhancing eco-system health, and improving livelihoods in Kenya.

Case 4: Integrated surveillance in Kenya

In several of Kenya's counties, mobile pastoralists keep large amounts of livestock. These animals often graze near to protected forests and game parks which brings them into close proximity to wildlife. This raises the public health risk of zoonotic spillover significantly. Outbreaks of diseases like rabies and anthrax can cause significant socio-economic shocks.

In response to the concerns of local communities about the risks of zoonoses, the Kenya Red Cross Society with support from the International Federation of Red Cross and Red Crescent Societies and the United States Agency for International Development initiated the "Community Epidemic and Pandemic Preparedness Program" in the Bomet, Narok, West Pokot, and Tharaka Nithi Counties.

The Red Cross in Kenya and its partners utilized a One Health approach to strengthen the ability of communities to prevent, detect and respond to disease threats, and prepare for future risks. Community-based surveillance (CBS) played a critical role in the programme's work for early detection of diseases as did multi-sectoral coordination of key stakeholders in disease prevention, control, and response activities.

The programme partners analysed CBS alerts and animal vaccinations in the programme's target areas for the period January–December 2022. Overall, 270 alerts (74 human and 196 animal) were detected by trained community health promoters and volunteers, with 36% of these alerts verified as true by supervisors. When tested, 57 animals had positive results for rabies and 6 for anthrax. In response, 4,606 animals were vaccinated against anthrax while 10,480 dogs and cats were vaccinated against rabies. These outcomes not only underscore the utility of CBS in early detection and early action but also highlight the value of a community-based One Health approach to addressing epidemics and pandemics.

Link: https://cbs.ifrc.org/resources/multi-sectoral-one-health-approach-disease-prevention-early-detection-and-control

Further reading

General resources:

- **FAO One Health Knowledge Nexus**: A One Health Knowledge Nexus consisting of Communities of Practice, powered and governed by the Quadripartite, to share knowledge and evidence on One Health in support of the mainstreaming of One Health. virtual-learning-center.fao.org/local/vlcs/view.php?id=12
- **FAO, UNEP, WHO and WOAH** (2022) One Health Joint Plan of Action (2022–2026). Working together for the health of humans, animals, plants and the environment. Rome. https://doi.org/10.4060/cc2289en
- **International Livestock Research Institute** (2024) One Health. https://www.ilri.org/one-health
- **One Health Commission:** A U.S. based 501c3 non-profit organization working globally to 'connect' One Health Stakeholders, to 'create' teams and networks that work together across disciplines to 'educate' about One Health and One Health issues. https://www.onehealthcommission.org/
- **WHO, FAO, UNEP and WOAH** (2023) A guide to implementing the One Health Joint Plan of Action at national level. Licence: CC BY-NC-SA 3.0 IGO. https://iris.who.int/bitstream/handle/10665/374825/9789240082069-eng.pdf?sequence=1
- **CABI One Health Cases:** One Health Cases is a curated collection of practical, educational case studies demonstrating One Health in practice**.** https://www.cabidigitallibrary.org/journal/ohcs
- **CABI One Health:** The journal focuses on the interconnections between humans, animals, plants, ecosystems, and their shared environment in a transdisciplinary way. https://www.cabidigitallibrary.org/journal/cabioh

History of One Health

Ancheta, J., Fadaak, R., Anholt, R. M., Julien, D., Barkema, H. W. and Leslie, M. (2021) The origins and lineage of One Health, Part I. *Canadian Veterinary Journal* 62(8), 883–885. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8281944/

Ancheta, J., Fadaak, R., Anholt, R. M., Julien, D., Barkema, H. W. and Leslie, M. (2021) The origins and lineage of One Health, Part II. *Canadian Veterinary Journal*, 62(10), 1131–1133. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8439323/

Bresalier, M., Cassidy, A., & Woods, A. (2020). One health in history. In *One Health: The Theory and Practice of Integrated Health Approaches* (pp. 1–14). https://www.cabi.org/wp-content/uploads/Chap1-9781789242577.pdf

King, T. (2021) The One Medicine concept: Its emergence from history as a systematic approach to re-integrate human and veterinary medicine. *Emerging Topics in Life Sciences* 5(5), 643–654. https://portlandpress.com/emergtoplifesci/article/5/5/643/229485/The-One-Medicine-concept-its-emergence-from

Lange, K. W. (2022) Rudolf Virchow as a pioneer of both biomedicine and social medicine. *Scandinavian Journal of Public Health* 50(7), 873–874. https://doi.org/10.1177/14034948221083735

Zinsstag, J., Schelling, E., Waltner-Toews, D. and Tanner, M. (2011) From “one medicine” to “one health” and systemic approaches to health and well-being. *Preventive Veterinary Medicine*

101(3–4), 148–156. https://doi.org/10.1016/j.prevetmed.2010.07.003. Epub 2010 Sep 15. PMID: 20832879; PMCID: PMC3145159.

Value of the One Health approach

Bhatt, S., Weiss, D.J., Cameron, E., Bisanzio, D., Mappin, B., Dalrymple, U., Battle, K.E., Moyes, C.L., Henry, A., Eckhoff, P.A. and Wenger, E.A., (2015) The effect of malaria control on *Plasmodium falciparum* in Africa between 2000 and 2015. *Nature* 526, 207–211. https://doi.org/10.1038/nature15535.

Eby, P., Peel, A. J., Hoegh, A., Madden, W., Giles, J. R., Hudson, P. J. and Plowright, R. K. (2023) Pathogen spillover driven by rapid changes in bat ecology. *Nature* 613(7943), 340–344.

Reid, M. C. and McKenzie, F. E. (2016) The contribution of agricultural insecticide use to increasing insecticide resistance in African malaria vectors. *Malaria Journal* 15(1), 1–8. https://doi.org/10.1186/s12936-016-1162-4.

Strode, C., Donegan, S., Garner, P., Enayati, A. A. and Hemingway, J. (2014) The impact of pyrethroid resistance on the efficacy of insecticide-treated bed nets against African anopheline mosquitoes: Systematic review and meta-analysis. *PLoS Medicine* 11(3), e1001619. https://doi.org/10.1371/journal.pmed.1001619.

Zoonoses

Horefti, E. (2023) The Importance of the One Health Concept in Combating Zoonoses. *Pathogens* 12(8), 977. https://doi.org/10.3390/pathogens12080977

World Health Organization (2023) Emerging zoonotic diseases and the One Health approach: An overview. https://www.who.int/docs/default-source/coronaviruse/risk-comms-updates/epi_win_digest_4_one-health.pdf?sfvrsn=b9feef83_2

Antimicrobial resistance

Brunn, A., Kadri-Alabi, Z., Moodley, A., Guardabassi, L., Taylor, P., Mateus, A. and Waage, J. (2022) Characteristics and global occurrence of human pathogens harboring antimicrobial resistance in food crops: A scoping review. *Frontiers in Sustainable Food Systems* 6, 824714. https://doi.org/10.3389/fsufs.2022.824714

Taylor, P. and Reeder, R. (2020) Antibiotic use on crops in low- and middle-income countries based on recommendations made by agricultural advisors. *CABI Agriculture and Bioscience* 1(1). https://doi.org/10.1186/s43170-020-00001-y

World Health Organization (2015) *Global action plan on antimicrobial resistance*. Geneva, Switzerland: WHO. https://www.who.int/publications/i/item/9789241509763

World Health Organization (2022) *WHO implementation handbook for national action plans on antimicrobial resistance: Guidance for the human health sector*. Geneva, Switzerland: WHO. https://apps.who.int/iris/handle/10665/352204

One Health and Plant Health

Boa, E., Danielsen, S. and Haesen, S. (2015) Better together: Identifying the benefits of a closer integration between plant health, agriculture, and One Health. In *One Health: The Added Value of Integrated Health Approaches* (pp. 258–271). CAB International, Wallingford, UK.

Danielsen, S., Alokit, C., Aliamo, C. and Mugambi, I. (2022) How crop-livestock clinics are advancing One Health: A pilot case from Uganda. *CABI One Health Cases*. CABI International, Wallingford, UK. https://doi.org/10.1079/onehealthcases.2022.0002

Fooks, T. (2020) International Development – One Health. *AHPA Science Blog*, 30 November. Animal and Plant Health Authority. https://aphascience.blog.gov.uk/2020/11/03/one-health-day-2020/

Mycotoxins

Imran, M., Cao, S., Wan, S. F., Chen, Z., Saleemi, M. K., Wang, N. and Munawar, J. (2020) Mycotoxins–a global one health concern: A review. *Agrobiological Records 2*(1), 1–16.

Nwaji, A. R., Arieri, O., Anyang, A. S., Nguedia, K., Abiade, E. B., Forcados, G. E. and Gotep, J. G. (2022) Natural toxins and One Health: A review. *Science in One Health* 1, 100013. https://doi.org/10.1016/j.sih.2022.100013

Pesticide hazards

Boedeker, W., Watts, M., Clausing, P. and Marquez, E. (2020) The global distribution of acute unintentional pesticide poisoning: Estimations based on a systematic review. *BMC Public Health 20*,1875. https://doi.org/10.1186/s12889-020-09939-0.

Leach, A. W., Mullié, W. C., Mumford, J. D. and Waibel, H. (2008) Spatial and historical analysis of pesticide externalities in locust control in Senegal—First steps. *Food and Agriculture Organization of the United Nations*, Rome, Italy.

Reid, M. C. and McKenzie, F. E. (2016) The contribution of agricultural insecticide use to increasing insecticide resistance in African malaria vectors. *Malaria Journal 15*(1), 1–8. https://doi.org/10.1186/s12936-016-1162-4

Schaffner, U., Steinbach, S., Sun, Y., Skjøth, C. A., de Weger, L. A., Lommen, S. T., … Müller-Schärer, H. (2020) Biological weed control to relieve millions from Ambrosia allergies in Europe. *Nature Communications* 11(1), 1745. https://doi.org/10.1038/s41467-020-15586-1

Strode, C., Donegan, S., Garner, P., Enayati, A. A. and Hemingway, J. (2014) The impact of pyrethroid resistance on the efficacy of insecticide-treated bed nets against African anopheline mosquitoes: Systematic review and meta-analysis. *PLoS Medicine* 11(3), e1001619. https://doi.org/10.1371/journal.pmed.1001619

United Nations Environment Programme (UNEP) (2022) *Synthesis report on the environmental and health impacts of pesticides and fertilizers and ways to minimize them*. Geneva, Switzerland. https://www.unep.org/resources/report/environmental-and-health-impacts-pesticides-and-fertilizers-and-ways-minimizing

Food systems

Animal and Plant Health Agency (APHA) (2022) One food for One Health. *APHA Science Blog*. 3 November. https://aphascience.blog.gov.uk/2022/11/03/one-food-for-one-health/

Bremner, J. *et al.* (2023) Operationalizing "One Health" for food systems. *One Earth* 6(12), 1618–1622. 10.1016/j.oneear.2023.10.010.